



**Changkat Changi Secondary School**

# **UNIT 3A**

## **Dynamics-Scalars & Vectors**

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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## NOTES 3A.1

### LESSON OBJECTIVES

At the end of the lesson, you will be able to:

- Understand and distinguish between **scalar** and **vector**
- **Add** two vectors using graphical methods

### What is a scalar?

**Scalar** quantities are physical quantities that have magnitude ( ) only.

An example of scalar quantity is mass.

### What is a vector?

**Vector** quantities, however, are physical quantities with both **magnitude** and **direction**.

An example of vector quantity is force.

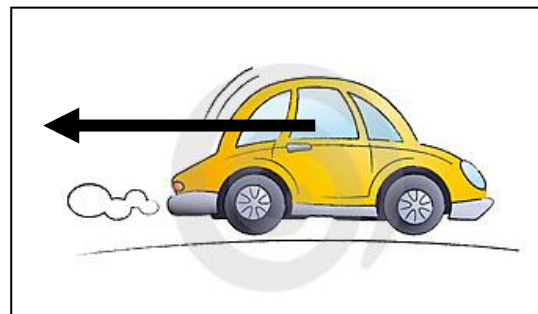
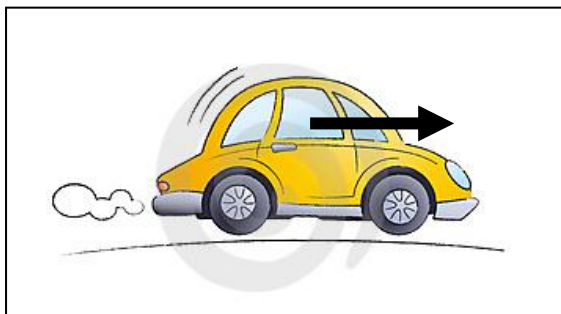
Based on definitions above, which of the following physical quantity is a **vector** or **scalar**? *Can you explain why?*

Physical Quantity	Scalar or vector?
Distance	
Displacement	
Speed	
Velocity	
Acceleration	
Weight	
Density	
Time	

### Vector Diagrams (<http://www.physicsclassroom.com/class/1dkin/U1L2c.cfm>)

Vector diagrams are diagrams that depict the direction and relative magnitude of a vector quantity by a vector arrow. For example, a vector diagram could be used to represent the motion of a car moving down the road.

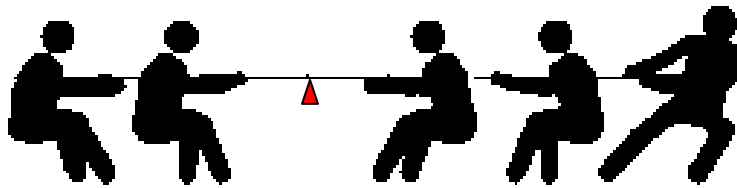
#### i. Single vector diagram



**Note!!!** In a vector diagram, the magnitude of a vector quantity is represented by the **SIZE** of the vector arrow. ( so which one do you think has a larger force acting on the car above?)

ii. More than 2 vectors diagram

In a tug of war shown below, if *each person exerts a force of 20N*, indicate the vectors exerted by the people on the rope.



**Finding resultant vector quantities**

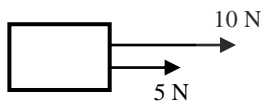
Due to unbalanced set of vector quantities acting on an object, an object will ultimately move in a resultant direction.

In vector diagrams related to forces, this is known as *resultant force*. In vector diagrams related to velocity, this is known as *resultant velocity*.

In vector diagrams this is denoted by a **Doubled Arrow** head.

**I. Adding Parallel Vectors**

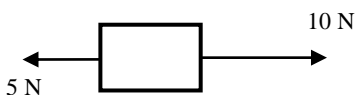
*Case 1 – Forces acting on object in same direction ( Add up magnitudes)*



Resultant force

=  
=

*Case 2 – Forces acting on object in opposite direction( Subtract magnitudes)*

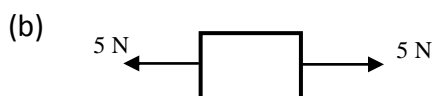
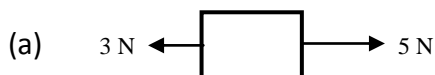


Resultant force

=  
=

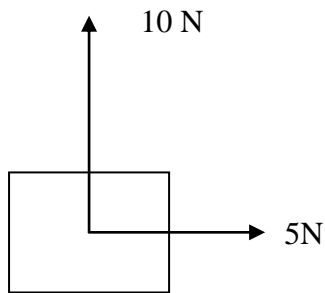
**Check!**

What is the resultant force shown below? Draw the force diagram showing the resultant force



## II. Finding resultant vectors for non-parallel vectors

In real life, forces/velocity act in more than one direction and with different magnitudes  
For example, can you determine the resultant force on the following object?



### Parallelogram Method

**Step 1:** Decide a suitable scale

1 cm : \_\_\_\_\_ N

**Step 2:** Draw vectors to scale and angle

**Step 3:** Draw parallel vectors using a ruler (dotted line)

**Step 4:** Draw resultant vector from start to end



Now try it when the forces at different angles:

